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THE NATIVE PERSIMMON.

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INTRODUCTION.

The persimmon seems to have been the first native American fruit to be described and praised by the early explorers. De Soto learned its food value in 1539, and in 1557 published an account of it at Evora, Portugal. The following year, 1558, Jan de Laet described the persimmon in his work on Virginia. John Smith's narrative of the settlements and resources of the New World, written during the first years of the seventeenth century, included a long discussion of the persimmon. In his reference to this fruit, where he says "If it be not ripe, it will draw a man's mouth awrie with much torment," he so well characterizes the puckering, astringent effect of the tannin contained in the immature fruit that no other comment is necessary.

The persimmon tree has received more criticism, both adverse and favorable, than almost any other known species. Those who have discussed the food value of the fruit, from the earliest chroniclers to recent writers, have prophesied that the tree would soon be accorded a place in our gardens and orchards. Those people, on the other hand, who have been acquainted only with the immature fruit or with the young sprouts in cultivated fields have had nothing to say

NOTE.—This is a general bulletin, intended for those to whom knowledge of the production, preparation, and uses of the native persimmon is of value.

in its favor and have bent their energies toward its destruction rather than its propagation and cultivation.

There are several factors which are responsible for the slow progress of persimmon development in this country. One reason for the neglect of this fruit seems to be the erroneous yet oft-repeated statement that persimmons are unfit to eat until they have either been touched by frost or frozen. Although this statement has been corrected by nearly every one who has studied the subject, nevertheless throughout the regions where persimmons are grown many of the best fruits are lost each year because they ripen and fall before frost or before they are supposed to be edible. The truth of the matter is that freezing is as detrimental to the quality of persimmons as to the quality of any other fruit. If persimmons are not edible and free from astringency before frost, it is because the variety is a late one and the fruit has not yet matured.

The development of the persimmon, whether for orchard or ornamental purposes, has been retarded by the difficulty encountered in propagating and transplanting it. One grower has characterized it as the only tree that he could not kill in his cultivated fields and the only one that he could not make live in his garden. Failure in transplanting is usually due to a lack of knowledge concerning the characteristic root development of the persimmon. Under natural conditions, the roots penetrate much deeper into the soil than those of most other fruit trees, and unless great care is exercised when the tree is taken up it is almost impossible to get more than a small percentage of the root system, thus reducing the chance of making the tree live when transplanted.

From time to time valuable trees have been discovered, cared for, and even in some cases transplanted or propagated. Most of these have been soon neglected or destroyed, until there are comparatively few varieties of marked value available for general distribution.

Both De Soto and Jan de Laet when describing the ripe fruit of the native persimmon call it a "delicious little plum," and John Smith and other writers of the seventeenth century speak of it as a plum with the flavor of an apricot. This use of the word "plum" doubtless directed the attention of many people to the native species of Prunus, which include our wild cherries and plums.

BOTANICAL CLASSIFICATION.

The persimmon belongs to the ebony family (Ebenaceæ) and is known to botanists as *Diospyros virginiana*. It is the only member of the family which is indigenous to any extensive portion of this country.

NATURAL DISTRIBUTION OF THE PERSIMMON.

Roughly speaking, the persimmon is indigenous to the southeastern quarter of the United States, being found in large numbers

in the fields and forests of that section. The more favored localities in Iowa and eastern Nebraska produce many fruits, but very few trees are found west of central Kansas. Scattering specimens in Connecticut and on Long Island mark the present northeastern limit of the species. A few trees in Rhode Island, New York, and Michigan which produce fairly well indicate that the northern limit of cultivation may be extended whenever economic conditions (that is, the value of the fruit for food or of the tree for ornamental purposes) seem to warrant.

The zone of greatest productivity and adaptability, wherein appear by far the largest number of promising types, extends from Maryland, Virginia, and the Carolinas westward through Missouri and Arkansas. The persimmon thrives equally well on the sands of the Coastal Plain, the shales of the Allegheny Mountains, the muck of the river-bottom lands, and the chert of the Ozarks.

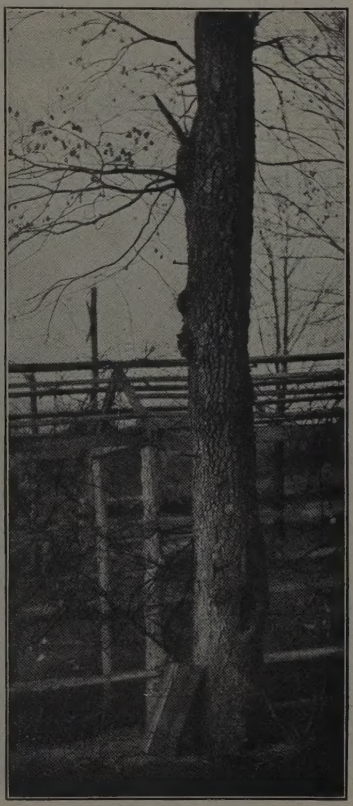

FIG. 1.—An old persimmon tree which shows the characteristic checking of the bark.

GENERAL DESCRIPTION OF THE PERSIMMON.

HABIT OF GROWTH.

Throughout the habitat of the persimmon there is a wide variation in the size and growth of the trees and in the form, size, color, and number of seeds of the fruit. The tree characters seem to indicate two types, upright and drooping, and these tree types are closely allied with the fruit types.

When grown in the open, persimmon trees rarely reach a height of 50 feet. In a dense forest growth they sometimes reach 70 or 100 feet, but that is uncommon. The characteristic checking of the bark of an old tree, which is shown in figure 1, aids one to recognize the species. The top of the tree is usually roundish or conical in form. Large trees are often somewhat irregular, owing to the breaking of limbs by heavy crops of fruit; moreover, it is a characteristic of productive trees to prune themselves by dropping many of the fruit-bearing twigs. The branches are always spreading, often

coming out almost at right angles to the trunk and then drooping more or less, especially after the tree has borne a few crops.

The leaves are elliptical or slightly ovate in form, acuminate at the apex, measuring from 3 to 6 inches in length and 1 to 3 inches in width, with a short petiole. In color, they are a dark glossy green on the upper surface and a grayish green underneath. Trees differ markedly, however, in habits of growth, as is shown in figures 2, 3, and 4.

FLOWERING HABIT.

The flowers resemble little four-lipped urns of wax, from one-fourth to three-fourths of an inch in length, the color varying from a greenish yellow to a milky white. They are borne on short stalks and appear from the last of April in the extreme South until the middle of June at the northern limit of the persimmon habitat.

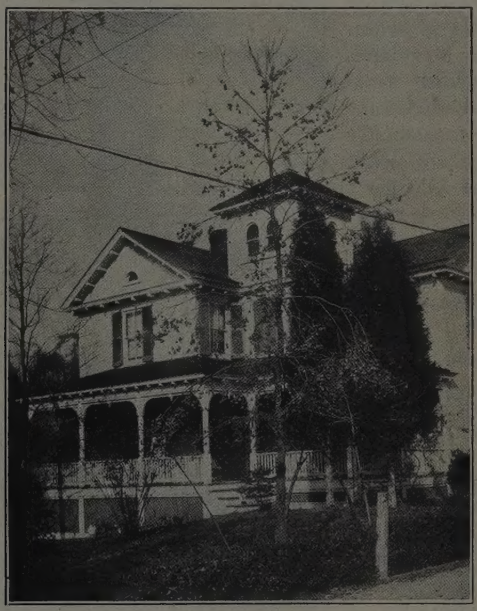

FIG. 2.—A persimmon tree of the upright type which produces large, oblate fruits and is here used as a dooryard tree.

The trees are generally dicœcious; that is, the pollen-bearing and fruit-producing flowers are borne on separate trees. The pistillate or fruit-producing flowers are borne singly, while the staminate or pollen-bearing flowers are generally produced in threes. The pollen is very light and powdery, and while it is generally distributed by the bees that frequent the trees in great numbers during blossoming time it can also be carried to great distances by the wind.

FRUIT CHARACTERS.

The fruit is a true berry, containing sometimes as many as eight seeds in its pale, translucent flesh. It varies in form from oblate to oblong and in diameter from three-fourths of an inch to 2 inches.

There is a wide range in color, varying from yellow to pale orange and even to a dark red, with many varietal markings, often blushed and covered with a bluish bloom. When green, persimmons are generally very astringent and puckery, because of the large quantity of tannin contained in the flesh, but when thoroughly mature and ripe the flavor is rich and sweet, and the consistency varies between that of a baked apple and a soft custard. The fruits of many late varieties turn a rich dark red and partially dry on the trees, somewhat resembling dates in appearance and flavor.

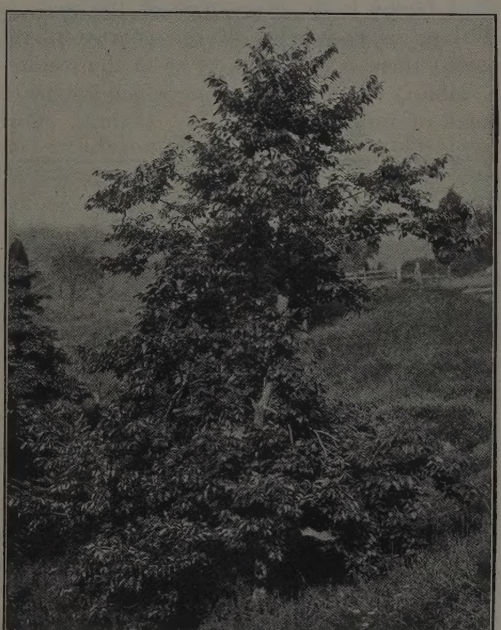

FIG. 3.—A persimmon tree of upright habit of growth which produces fruit of the pyriform type, ripening in midseason.

POSSIBILITIES OF IMPROVEMENT.

The season of the native persimmon is probably longer than that of any other wild fruit, both locally and over the country as a whole. In many sections the earliest and the latest varieties may be found growing side by side, or at least within a few miles of each other. The Bureau of Plant Industry has records for both early and late varieties from the southern part of Georgia and Florida. In the District of Columbia there are some trees which ripen their fruit in August and others on which it hangs until February.

Generally speaking, the best fruits are neither the earliest nor the latest, but rather those that ripen just before the beginning of the tree's dormant season. The latest varieties are still immature when the leaves fall or when they are killed by frost, and they must complete the ripening process within themselves instead of drawing nourishment from the tree until they have grown to maturity.

The largest as well as the best fruits are those that ripen about the time the trees shed their leaves. The early varieties are nearly all medium in size, and the late varieties which hang on until cold weather

are generally small. Seedless fruits, as a rule, are smaller and earlier than those with seeds produced on the same trees.

The wide variations shown by the fruit in size, color, season of maturity, and tendency to seedlessness, and by the trees in size, shape, and vegetative vigor indicate the possibility of greatly improving the native persimmon. Up to the present time one essential factor has been overlooked in all attempts at breeding better varieties. That factor is the parentage of the male or pollen-bearing trees. Without a knowledge of the characters represented in the male parent there is no certainty as to the results of the crossing and no possibility of the line breeding which is essential to the rapid development of improved varieties. Definite efforts should be made in breeding work to secure pollen-bearing trees of known parentage. They should be selected from among trees grown from seed produced on the most desirable fruit-bearing trees.

FIG. 4.—A persimmon tree which has a drooping habit of growth and produces fruit of the oblong type.

PRESENT STATUS OF THE NATIVE PERSIMMON.

Throughout the region where persimmons are found in abundance the fruit is considered as being "good for dogs, hogs, and 'possums." Occasionally a family is mentioned as having lived for several months upon the fruit from a single large tree. Twenty or thirty nurserymen are selling seedling trees for ornamental planting and half a dozen others have selected named varieties of special merit which they offer for the production of fruit.

In some of the large cities and towns within the persimmon habitat, the wild fruit can be purchased during the autumn and early winter from the dealers who occupy the open stalls in the public markets. A few enterprising growers adjacent to large cities have built up a demand which they find themselves unable to supply.

The methods of utilizing the persimmon are at present rather limited. Fresh fruit is used in various ways—in making a few forms of bread or pone, in preparing certain homemade beverages and sweetmeats, and as forage for the hogs and dogs which get most of their living from the woods.

The object of this publication is to set forth the best methods of propagating and cultivating persimmon trees, to call attention to the many trees worthy of propagation, to indicate the food value of the fruit, and to enumerate various ways in which persimmons may be prepared.

PROPAGATION OF THE PERSIMMON.

As is the case with most tree fruits, the persimmon does not reproduce its varietal characteristics through the seed, and other methods of propagation are, therefore, necessary to perpetuate desirable varieties. Propagation of the persimmon by the methods commonly employed with tree fruits is more difficult than for such fruits as the apple or the peach. The methods described below have been found successful in actual practice.

SEEDAGE.

The seeds of the persimmon are scattered by mammals and birds and in the natural sequence of events reach the ground in the fall or winter without becoming dry. They are lightly covered with grass or leaves and are subjected to the varying temperatures of winter, always remaining moist. The following spring the seeds sprout as soon as the soil becomes warm enough, provided that the conditions accompanying the rise in temperature do not dry them unduly. Seeds which fall under the trees are usually too much exposed to the atmosphere and dry too much to admit of germination.

Seeds that are gathered for propagating purposes should be stratified at once. If they are allowed to dry out it is often necessary to soak them for two or three days before they are planted, the water being renewed each day at a boiling temperature.

The seed bed in which persimmon seedlings are grown should be located on well-drained land where the soil is rather light and well supplied with humus. The ground should be plowed deep with a subsoil plow unless the subsoil is friable enough to permit the ready penetration of the long taproots which characterize the growth of persimmon seedlings.

The seed may be planted either in the fall or spring, after being treated as described above. It is commonly planted in shallow drills and lightly covered with soil to a depth of one-half inch or a little more.

CUTTAGE.

ROOT CUTTINGS.

The roots of persimmon trees sprout readily when the top is removed or when the main stem meets with serious injury. This is illustrated in figure 5, which shows the development of sprouts on the roots of a seedling tree two months after the removal of the top. During this period the seedling had been in a propagating bed in a greenhouse, under artificial heat. This illustration also offers an explanation for the occurrence of the large clumps of similar trees that are to be found in many abandoned fields. At some time the original tree was cut off near the surface of the ground and the roots sent up sprouts which, being undisturbed, developed into trees bearing similar fruit.

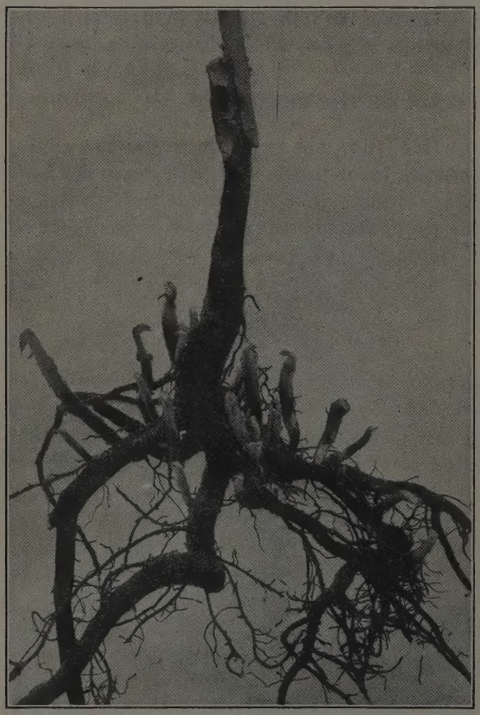

FIG. 5.—A 2-year-old seedling persimmon tree which has been grafted. It has been in a propagating bed in a greenhouse under artificial heat for two months. The sprouts on the roots show how easily the roots may be used as a means of propagating the variety.

Roots the size of a lead pencil or larger can be used in propagating the persimmon. They should be cut into pieces 6 or 8 inches long, the ends sealed with grafting wax, hot beeswax, or pitch, in order to prevent the decay that develops rapidly in the soft, spongy wood, and the cuttings should then be buried over winter in sand or in a nursery row. They will grow readily the following spring, provided the moisture supply is plentiful until they become well established.

WOOD CUTTINGS.

Cuttings of the branches may be treated in much the same way as root cuttings. Small twigs are unsuitable for purposes of propaga-

tion (1) because they lack sufficient substance to produce the callus and root formation and (2) because it is extremely difficult to prevent the organisms of decay from entering the soft, porous, 1-year-old wood. The cuttings should be waxed or pitched at both ends and buried until well callused and the roots have started. They may then be planted in a nursery row and vegetative growth encouraged.

Wood 2 or 3 years old may be selected for cuttings, but care must be exercised to procure good, strong buds. The cuttings may be taken at any time after the trees become dormant in the fall and may be placed in cold storage or in sand until wanted. It is most important, however, that the ends of the cuttings should be dipped immediately into melted wax in order to exclude the air. If they have been exposed for even a few hours they should be retrimmed and waxed before being put in cold storage or sand.

GRAFTAGE.

Those who have trees bearing exceptionally fine persimmons will find the different methods of grafting admirally adapted to top-working the worthless trees about the place with the better varieties, thus changing them to useful fruitfulness.

Top-worked, or grafted, portions of old trees will bear two or three years earlier than trees which come from buds or grafts on 1 or 2 year old stocks. These seedling stocks, budded or grafted with a selected variety, will bear one or two years earlier than those produced from cuttings.

The scions to be used in chip budding, cleft grafting, and whip grafting should be cut during late winter. All scions should be kept cool and moist until used. The budding and grafting should be done as soon as the trees which are to be grafted start to grow.

Because of the similarity in the operations of budding and grafting they are here treated together under the general heading of graftage. The various methods which have been found to be best adapted to the persimmon are here discussed.

SELECTION OF SCIONS AND BUD STICKS.

When selecting scions or bud sticks care must be exercised, just as when propagating by wood cuttings, to procure wood with strong, well-developed buds. On twigs of the last season's growth the best buds are generally near the base, where they are supported on more mature wood than those near the tip. In wood more than a year old, most of the buds near the tip have already produced branches, thus making this portion of the twig unsuitable for use in budding or grafting.

The method employed in budding persimmons largely determines the character of the wood that should be selected as a source of buds.

For the common shield or T bud, the basal half of the new growth is preferable because the bark is thinner than that on older wood and the buds fit closer and better than where wood with older and thicker bark is used. Moreover, the buds near the base of the new wood are better than those toward the tip, because the latter are so irregular in outline that it is difficult to fit them closely to the stock.

When the chip-bud method is used it is essential that the bud stick have sufficient body to allow the removal of the bud with a clean, solid chip adhering thereto. A bud stick should never be larger than the stock on which the buds are to be worked. If it is too large in relation to the size of the stock which is to receive the bud, the chip will be so broad and flat that it can not be properly fitted into any notch which it is possible to make in the stock.

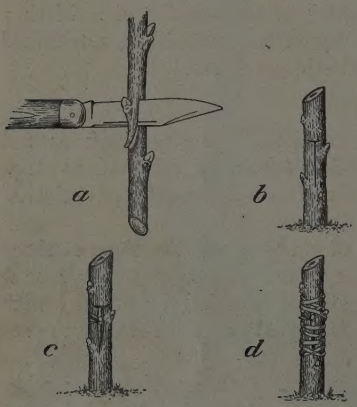

FIG. 6.—The different steps in shield or T budding: *a*, Cutting the bud; *b*, preparing the stock; *c*, inserting the bud; *d*, tying.

For annular or patch budding, the most satisfactory buds are those taken from wood that is 2, 3, or even 4 years old. Such buds are but lightly attached to the wood and have a good body of bark, which makes them easy to handle and not liable to dry out. Buds taken from near the base of large, vigorous, new shoots will also give good results.

The various methods of budding and grafting that have proved satisfactory in propagating the persimmon have been described in detail in publications of the Department of Agriculture relating to other fruits and to nuts. For convenience in the present connection, extracts from these publications are inserted below.

SHIELD OR "T" BUDDING.[1]

The height at which buds are inserted [where small seedling stocks are used] varies with the operator. In general, the nearer the ground the better. The cut for the reception of the bud is made in the shape of a letter T. (Fig. 6, *b*.) Usually the crosscut is not quite at right angles with the body of the tree, and the stem to the T starts at the crosscut and extends toward the root for an inch or more. The flaps of bark caused by the intersection of the two cuts are slightly loosened with the ivory heel of the budding knife, and the bud, grasped by the leaf stem as a handle, is placed under the flaps and firmly pushed in place until its cut surface is entirely in contact with the peeled body of the stock. (Fig. 6, *c*.) A ligature is then tightly drawn about, above, and below the bud, to hold it in place until a union shall be formed.

[1] Corbett, L. C. The propagation of plants. Farmers' Bulletin 157, pp. 22–23.

(Fig. 6, *d*.) Bands of raffia about 8 or 10 inches long make a most convenient tying material. As soon as the buds have united with the stock the ligature should be cut, in order to prevent girdling the stock. This done, the operation is complete until the following spring, when all the trees in which the buds have "taken" should have the top cut off just above the bud.

Shield budding may be done at any time when the trees are in vigorous growth and when well-matured buds of the current season's growth can be obtained. This period usually extends from July to September. When budding seedlings it may sometimes be necessary to delay the operation until the latter part of the season, in order that the stock may develop to a satisfactory size; but when top-working older trees by this method well-developed buds may be handled whenever the trees are in a vigorous condition of growth. Figure 7 shows a branch of a young persimmon tree on which a shield or T bud has made considerable growth.

FIG. 7.—A shield or T bud after considerable growth has been made.

Some of the precautions which it has been found important to observe when propagating pecans are equally applicable in the propagation of persimmons. The following directions for budding pecans according to the various methods are therefore presented here.[1]

ANNULAR BUDDING.

The process [of annular budding] is also known as "ring" and "flute" budding. It is performed during the midsummer months at such time as the bark is found to slip (release) most readily. In some seasons this period may be very brief, lasting only a few days, while in other years the time during which annular budding may be successfully performed extends over a period of several months. In the latitude of southern Georgia it is not uncommon for this method to be successful from as early as May 10 until late in July or even in August.

Annular budding consists merely in transferring a ring of bark to which is attached a bud of the desired variety from a bud stick[2] to the trunk or branch of another tree in place of a similar ring of bark previously removed. Specially designed tools have been devised for the purpose of cutting the rings. Two ordinary propagating knives having single blades may be fastened together and made to answer the purpose, although they are less liable to make uniform incisions. Cut a ring of bark from the stock with one of the tools, slit it with a single-bladed knife, and lift from its bed or "matrix," as it is technically called. Discard this bark and from the bud stick

[1] Reed, C. A. The pecan. Bureau of Plant Industry Bulletin 251, pp. 25–31.

[2] The bud stick is a branch cut from a tree of the variety to be propagated.

remove a similar ring, in the center of which is a dormant bud. The bark of the bud stick should be slit on the side opposite the bud. Immediately place this ring in the space left by removing the bark from the stock and wrap at once with waxed cloth, taking care not to cover the bud (fig. 8).

PATCH BUDDING.

When the annular method is used it is obvious that the stock and scion must be of nearly the same size. If the bud stick is slightly larger than the stock a portion of the bark to which the bud is attached may be cut away so that the two ends of the ring just meet around the stock. If the bud stick should be smaller than the stock, a strip of bark on the latter may be left in position to complete the ring. In actual practice, rings which extend only partly around the stock are most commonly used. Such process, however, is not true annular budding, because any bark which extends only partly around the stock is merely a patch. It is to this deviation from the annular method of budding that the term "patch budding" has been applied. A tool specially designed for patch budding consists of four thin steel blades fastened together in the form of a rectangle, five-eighths of an inch wide by 1 inch long, and is used as a punch.

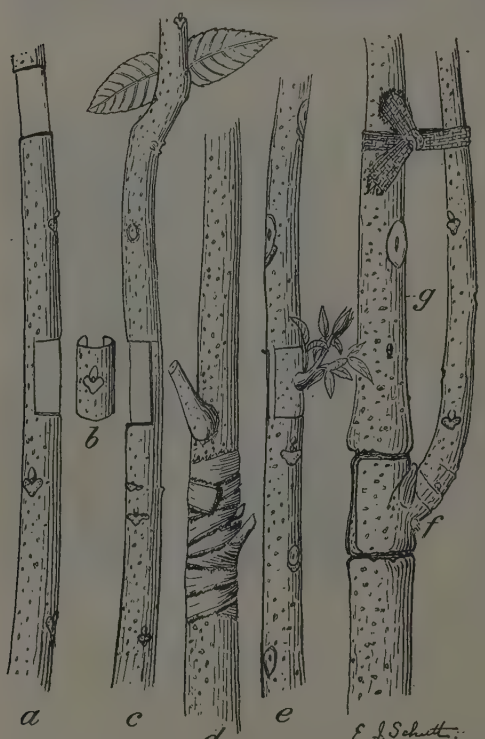

FIG. 8.—Annular budding. *a*, Bud stick from which the bud has been removed; *b*, the bud ready for insertion in the matrix of the stock; *c*, the stock ready to receive the bud; *d*, the bud after being placed in position and carefully wrapped; *e*, growth taking place, the wrapping having been removed; *f*, growth from the bud supported by being tied to the stock (*g*) above the union. Note the scars above the union, where the buds were removed in order to direct the flow of sap to the new bud.

A cut is made in the bark of the bud stick about half an inch in width by three times as long, in the center of which is the bud. The piece of bark so outlined is removed from the bud stick and laid over that of the stock. Using this as a pattern, incisions are then made around it in the bark of the stock. The pattern is then removed, the section of bark outlined in the stock is lifted, and the bark from the bud stick is put in its place. Some varieties of the pecan are more difficult to bud successfully than others; with such varieties the annular method, or a near approach to it, is generally most successful.

With the average sorts, however, the tendency among the more experienced nurserymen is much inclined to favor the patch method.

The buds best suited to annular or patch budding are those in the axils of the leaves at the base of the current season's growth. It is well worth the time required to clip the leaves away, close to the buds, 10 days or 2 weeks before the bud is wanted, for by so doing the wound will heal over before the bud is needed; otherwise a serious lessening of the vigor of the bud through evaporation may take place.

CARE OF ANNULAR AND PATCH BUDS.

In annular budding the added ring of bark sometimes unites with the stock promptly, permitting the upward flow of sap to proceed without much interference. When this is the case the top should be carefully pruned back to such a degree as is necessary to direct sufficient sap into the new bud to cause it to swell. This pruning should not be done with too great severity, as an oversupply of sap is liable to accumulate under the bark of the new bud and cause it to decay, or, as it is termed, "to drown" the bud. If the tree is young and the growth has been rapid, precaution should be exercised in cutting back the top, in order not to expose the tender bark to the heat of the sun. A sufficient amount of foliage should be left as a protection from the hot sun. If the supply of sap be limited, it will be well to cut out all buds in the top of the stock, as shown in figure 8. All dormant buds, both above and below the new bud, should be rubbed off as soon as they begin to swell. The wrapping about the new bud must be cut as soon as growth begins. As the union of a bud with a stock made by any method of budding is at first merely the uniting together of bark and not of wood, it is necessarily weak during the first few months. To avoid danger of breaking out at the bud, the new tops should be provided with extra support. For this purpose side stakes driven into the ground are sometimes used, but these are expensive and unnecessary. By leaving a stub of the original top 8 or 10 inches long, entirely denuded of foliage (fig. 8), the new top may be quickly tied to it, and when no longer needed the dead stub may be cut away close to the union.

FIG. 9.—Chip or "dormant" budding. *a*, The bud stick; *b*, the bud ready for insertion; *c*, the bud inserted in the matrix of the stock; *d*, the bud securely tied in place.

CHIP BUDDING.

Propagation by chip budding is performed in the early spring or late in the dormant period. Because of being done at this season it is also known as "dormant" budding.

With a sharp knife a downward cut is made below the bud on the bud stick to a depth of perhaps one-eighth of an inch. Raising the knife to a point above the bud, a long downward cut is made, which meets the lower end of the first cut, and the bud is removed with a chip attached, as shown in figure 9. A similar chip is removed from the stock, and the desired bud is put in its place. This should be carefully wrapped with such material as will hold the cambium layers of the stock and the bud firmly together on at least one side.

Subsequent treatment similar to that already described for annular and patch budding should be given young trees propagated in this summer.

Trees of the pecan species are difficult to propagate asexually; that is, neither buds nor scions "take" with the readiness of ordinary fruit trees. The inexperienced

FIG. 10.—A chip bud on a branch after the bud inserted had made considerable growth.

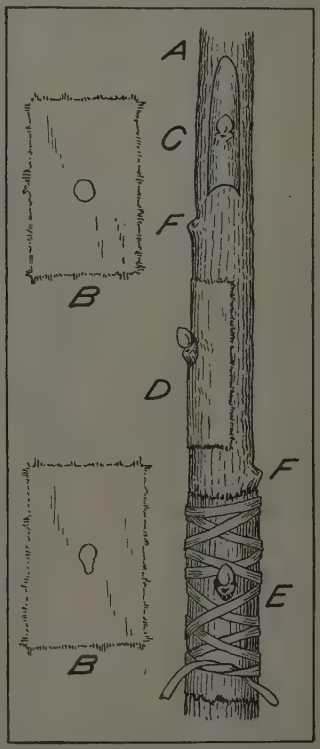

FIG. 11.—Method of using a bud protector on a chip bud. The protector may be used in a similar manner in all of the different forms of budding. *A*, stock; *B*, *B*, waxed cloth protectors; *C*, chip bud fitted into notch in stock; *D*, protector in position over the bud; *E*, protector and bud wrapped and tied; *F*, *F*, scars of buds removed from stock. (Adapted from drawing in American Fruit and Nut Journal, vol. 6, whole no. 94, p. 23.)

operator, therefore, must expect a very low percentage of living buds as the result of his first attempts. Skilled propagators, however, are now so successful that under favorable conditions the percentage of failures is no longer a matter of consequence.

No attempt to bud pecans should be made on rainy days, or in early mornings following heavy dews. Some nurserymen even go so far as to select their men for budding the pecan, assigning those who perspire most freely to other duties. Extremely hot days should be avoided, especially if accompanied by drying winds. Moderately cool, cloudy days without wind or rain are the best for pecan budding.

Figure 10 shows a persimmon chip bud which has made considerable growth.

PROTECTION OF BUDS.

A very satisfactory means of affording protection to buds inserted by any of the foregoing methods is shown in figure 11. These waxed shields are intended as a substitute for the waxed strips previously mentioned, and their preparation and use has been described as follows:[1]

In making the waxed wrappers, old domestic from worn bed sheets or undergarments may be used. Tear it into strips 2 feet long and 6 inches wide; then fold it into squares and dip it into a tin plate of hot, melted beeswax. The wax will strike through instantly, and then the strips may be held up by one end and the surplus wax allowed to drip back into the tin plate. When cool, the cloth may be torn into * * * squares of proper size. No pressing or squeezing is necessary. The beeswax answers the purpose in every way; its saves the buds, and that is the end in view. These

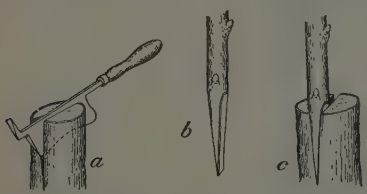

FIG. 12.—Cleft graft: *a*, Stock being split by special grafting tool; *b*, scion ready for insertion; *c*, scion in place ready for waxing.

wrappers may be left on the buds the whole season. When the bud shoots are an inch or so in length, the strings may be unwound from so much of the wrappers as cover the buds; but tie the upper end of the wrapper, which is above the bud, firmly to the projecting stub. The eyelets[2] in the wrappers will open as the bud shoots grow, and protection will be afforded against hot suns and chilly nights.

CLEFT GRAFTING.[3]

This style of graft is particularly adapted to large trees when for any reason it becomes necessary to change the variety. Branches too large to be worked by other methods can be cleft-grafted.

FIG. 13.—A cleft graft made on a small branch.

A branch 1 or 1½ inches in diameter is severed with a saw. Care should be taken that the bark be not loosened from any portion of the stub. Split the exposed end with a broad, thin chisel or grafting tool (fig. 12, *a*). Then with a wedge or the wedge-shaped prong at the end of the grafting tool spread the cleft so that the scions (fig. 12, *b*) may be inserted (fig. 12, *c*).

[1] American Fruit and Nut Journal, v. 6, no. 94, p. 22.

[2] The eyelet referred to is the small hole in the center of the protector shown in figure 11.

[3] Corbett, L. C. The propagation of plants. Farmer's Bulletin 157, pp. 17-18.

The scion should consist of a portion of the previous season's growth and should be long enough to have two or three buds. The lower end of the scion, which is to be inserted in the cleft, should be cut into the shape of a wedge, having the outer edge thicker than the other. In general, it is a good plan to cut the scion so that the lowest bud will come just at the top of this wedge, so that it will be near the top of the stock. The importance of having an intimate connection between the growing tissues of both scion and stock can not be too strongly emphasized, for upon this alone the success of grafting depends. To make this contact of the growing portions doubly certain, the scion is often set at a slight angle with the stock into which it is inserted, in order to cause the growing portions of the two to cross.

Fig. 14.—A cleft graft made at the crown, the soil which normally covered the union having been removed in order to show the parts to better advantage.

After the scions have been set the operation of cleft grafting is completed by covering all cut surfaces with a layer of grafting wax.

Cleft grafting has given satisfactory results with the persimmon, both on the branches (fig. 13) and at the crown (fig. 14).

WHIP GRAFTING.[1]

Whip grafting is the style almost universally used in root grafting. It has the advantage of being well adapted to small plants.

The graft is made by cutting the stock off diagonally—one long smooth cut with a sharp knife, as shown in figure 15, *c*. Place the knife about one-third of the distance from the end of the cut surface, at right angles to the cut, and split the stock in the direction of its long axis. Cut the lower end of the scion in like manner (fig. 15, *b*), and when the two parts are forced together, as shown in figure 15, *c*, the cut surfaces will fit neatly together, and one will nearly cover the other if the scion and stock are of

[1] Corbett, L. C. The propagation of plants. Farmers' Bulletin 157, pp. 18–19.

the same size. A difference in diameter of the two parts to be united may be disregarded unless it be too great. After the scion and stock have been locked together, as shown in figure 15, *c*, they should be wrapped with five or six turns of waxed cotton to hold the parts firmly together.

While top grafting may be done in this way (fig. 16), it is in root grafting that the whip graft finds its distinctive field. When the roots are cut into lengths of 2 to 5 or 6 inches to be used as stocks, the operation is known as piece-root grafting. Sometimes the entire root is used.

In ordinary propagation by means of whip grafts, the scion is cut with about three buds, and the stock is nearly as long as the scion. The graft is so planted as to bring the union of stock and scion not very far below the surface of the ground.

CARE OF WHIP GRAFTS.[1]

When grafted by the whip-graft method the young trees will require little subsequent attention other than pruning and ordinary cultivation. When the root is that of a very young tree there will be no danger of the supply of plant food being such as to induce a growth of top that is too rapid, as is frequently the case with cleft grafts, especially in the tops of old trees. While temporary staking as a support to the union is not necessary, in numerous cases stakes will be highly essential to insure erect growth. The moisture of the ground causes the wrapping material to decay in the course of a few weeks, and it is therefore not necessary to cut the bands.

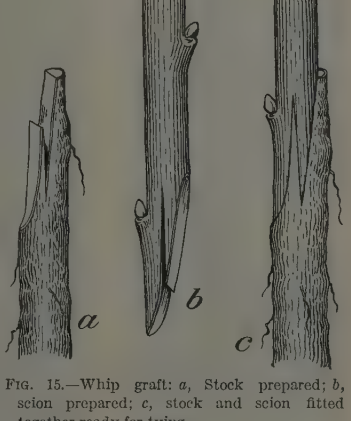

FIG. 15.—Whip graft: *a*, Stock prepared; *b*, scion prepared; *c*, stock and scion fitted together ready for tying.

The operation of grafting most fruits is generally successful if performed in the spring when the trees are still dormant, or even after growth has started slightly, provided the scions are entirely dormant. In the case of the persimmon, however, much more satisfactory results appear to be obtained when the grafting is delayed until the trees have definitely started into new growth. The scions must be kept dormant.

In all of the various methods of budding and grafting the persimmon it is of the utmost importance that the cut surfaces of both bark and wood be protected with as little delay as possible from chemical change due to exposure to the air. Protection is afforded by covering the wounds with grafting wax, waxed cloth, or similar devices.

STOCKS AND NURSERY TREES.

The stocks in the nursery row should stand at least 6 inches apart, to afford space for root development and to give the workmen plenty of room when the trees are budded or grafted. The young trees

[1] Reed, C. A. The pecan. Bureau of Plant Industry Bulletin 251, p. 25.

in the nursery should receive fair cultivation, and the roots should be pruned each year with a tree digger or spade in order to keep the root system small enough to be handled with ease when the trees are dug. The 2-year-old roots are always preferable for stocks. Older roots which are small enough to be easily handled are likely to be stunted, and 1-year-old roots must be very thrifty to produce the desired growth in the graft.

FIG. 16.—A whip graft after attaining considerable growth.

FIG. 17.—Persimmon trees after making one season's growth in the nursery. These trees were propagated by grafting on seedling stocks. The bundle on the left is the Golden Gem variety; on the right, the Miller. The largest trees are 4 to 5 feet tall. The difference in the size of the trees in the two bundles is due to the difference in the natural vigor of growth of these two sorts.

Trees which have been produced under conditions favorable for development may be planted in their permanent location after they have made one season's growth in the nursery. Some varieties, however, are much more vigorous than others. It may be advisable to grow the weaker sorts in the nursery for two years

before transplanting them. Figure 17 shows two varieties of grafted persimmon trees that have made one season's growth in the nursery.

On account of the very long taproot which persimmon trees habitually develop, particularly when propagated on seedling stocks, much care must be exercised to avoid undue injury to the root systems when the trees are dug from the nursery. Moreover, because of the deep-rooting habits of these trees a deep soil should be selected for their permanent location.

CULTIVATION OF THE PERSIMMON.

PLANTING.

The transplanting of the young trees may be done at any time during the dormant period, from late autumn to early spring, when the roots can be protected from freezing temperatures and evaporation and when the soil is in a suitable condition for handling. If the trees have been properly taken up without undue injury to the roots, the tops will need little or no pruning. If, on the other hand, the root systems have been severely reduced, the tops should be headed back until the total length of branches and trunks corresponds in a general way to the total length of the main roots. Wounds on both tops and roots should be waxed as soon as made.

Young persimmon trees have large, deep root systems and should be planted 2 or 3 inches deeper in the orchard than they were in the nursery row. In setting them out the soil should be packed thoroughly around the roots. A round-pointed wooden tamp is a very serviceable tool with which to make the earth compact as the hole is filled up. The planting plan varies with the type of tree desired. If it seems desirable to grow low-headed trees with the expectation of producing large fruit that can be readily picked by hand, the permanent trees should be placed at least 16 or, better still, 20 feet apart each way. If, however, a large bulk of fruit is desired as stock feed to be scraped from the ground or picked up by animals, a fair degree of success may be expected if the trees are planted 10 feet apart each way.

TILLAGE.

Probably the persimmon can be more successfully intercropped than any other fruit tree, owing to the depth of its root system. Blackberries, dewberries, strawberries, and vegetables thrive very well among persimmons until the shade becomes too dense. When the trees shade the ground, it is best to seed down the orchard if it is to be used as a run for chickens, calves, pigs, or other animals and the fruit used as stock feed. If it is planned to produce fruit for market purposes, however, the same cultivation should be given the ground as in a commercial orchard of peach or other fruit trees.

PRUNING.

The pruning of the persimmon varies with the variety. There is a tendency for the tree to prune itself, as many of the fruit-bearing twigs die and drop off with their fruit, thus making the natural open growth of the trees still more open and reducing to a minimum the necessity for pruning. There are two points, however, which should be borne in mind: (1) The upright tendency of some of the most vigorous varieties should be checked by pinching off the tender growing tips as they get out of reach, and (2) those trees that do not prune themselves sufficiently to keep the top well open should be thinned by removing entire limbs either main or secondary. This practice is preferable to opening the tops by thinning out the small branches and thus leaving the larger limbs bare for a considerable portion of their length. Thinning admits light and air, and at the same time a stronger vegetative growth is induced; the result is that the size of the fruit is kept uniform and the crops are made more regular by reducing the tendency to overbear on alternate years.

All wounds should be painted or otherwise covered as soon as made, in order to prevent the wood from drying or dying back and decay from entering the body of the trees.

DISEASES AND INSECT PESTS.

The persimmon is exceptionally free from the attacks of diseases and insect pests. Probably the most important of the insect enemies of the persimmon is the hickory twig girdler. The following brief account of the life history and habits of this insect, prepared for this bulletin by the Bureau of Entomology, may be of interest to those who anticipate growing the persimmon:

The hickory twig girdler, *Oncideres cingulata* Say, makes its appearance about the middle of August and may be found until the first of October. It begins depositing its eggs about the latter part of August and continues the process well into October. The eggs hatch in from seven to nine days after deposition, and the young larva begins to feed on the inner bark and wood at the point where the egg was inserted beneath the bark. As the larva increases in size it continues to feed on the wood, going deeper into the twig, and by the time its full growth has been attained it often completely hollows out the twig for some little distance from the point where it began work. Some of the larvæ attain their full growth and begin transformation to pupæ about the first of August. Others do not make this change until near the middle of September. The pupal stage lasts from 10 to 14 days, when the insects transform to adults and emerge from the twigs where they have spent their lives. Several days pass before they begin laying their eggs in the small limbs and twigs.

The injury caused by this insect occurs in the process of oviposition. The adult gnaws a small hole in the bark, usually just above or just below a bud, and the egg is inserted beneath the bark by means of the ovipositor. Several eggs are usually deposited in a twig in this manner, and the insect then begins girdling the twig beneath the point of oviposition by gnawing out small pieces of the bark. A ring is thus made around the twig, perhaps a third of the way through, weakening it to such an extent that it is broken off by the wind during the winter or the following spring. The trees are often severely injured by having the young growth pruned off in this manner.

In order to control this insect the twigs should be picked up from the ground in June or early July. All twigs which are found at this time have been girdled and broken from the tree and should be collected and burned in order to destroy the insects which are inside them.

USES OF THE PERSIMMON TREE.

The largest purchases of persimmon wood are made by the manufacturers of cotton-mill supplies, who use the timber in making bobbins. The wood is well suited for this work, as it is strong, comparatively light, hard, elastic, and close grained, taking a high polish. Shoe lasts are also made to some extent from persimmon wood.

The tree has some value for shade and ornamental purposes. Concerning this use of the native persimmon Mr. F. L. Mulford, landscape gardener of the Department of Agriculture, writes as follows:

As an ornamental for lawns the persimmon compares favorably with any of the shade trees used on private grounds, provided that it does not overhang a sidewalk, where the dropping of fruits would be objectionable. The broad, glossy leaves on the gracefully drooping branches give a dense shade from early in the spring until the autumn is well advanced.

In the early summer the little waxlike flowers fill the air with a delicious fragrance, somewhat resembling that of the calla lily. When the fruit begins to mature, yellowish and golden clusters appear among the dark-green leaves and add to the beauty of the tree until they fall. Some of the later varieties are ornamental after the leaves have fallen and even until well into the winter.

USES OF THE PERSIMMON FRUIT.

The only fruit which equals the persimmon in food value is the date. This is shown by the analyses presented in Table I.

TABLE I.—*Comparative analyses of fresh fruits, showing their food values in percentages of the weight of the fruit.*[1]

Fruit.	Total solids.	Ash.	Protein.	Sugars.	Crude fiber.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Apples	13.65	0.28	0.69	10.26	0.96
Blackberries	13.59	.48	.51	4.44	5.21
Cherries	22.30	.65	.81	11.72	.62
Currants	15.23	.72	.51	6.38	4.57
Dates	[2][3] 66.86	[4] 1.20	[5] 1.48	[6] 56.59	[7] 3.80
Figs	20.13	.57	1.34	15.51	.....
Grapes[8]	[2] 21.83	.53	.59	[9] 17.11	3.60
Oranges (Navel)	13.87	.43	.48	15.91	.....
Peaches[7]	[2] 10.60	.40	.70	[6] 5.90	3.60
Pears	16.97	.31	.36	8.26	4.30
Persimmons[10]	[2] 35.17	.78	.88	[9] 31.74	1.43
Plums	15.14	.61	.40	3.56	4.34
Raspberries	13.79	.49	.53	3.95	5.90
Strawberries	9.48	.60	.97	5.36	1.51

[1] Data, with exceptions as noted, from Bureau of Chemistry Bulletin 66, pp. 41–42.
[2] Dry matter.
[3] Average of 11 analyses. See "Chemistry and ripening of the date," Arizona Agricultural Experiment Station Bulletin 66, p. 408.
[4] See "Principles of nutrition and nutritive value of food," Farmers' Bulletin 142, p. 18.
[5] Adapted from the two publications mentioned in footnotes 3 and 4.
[6] Fats and carbohydrates.
[7] See "Use of fruit as food," Farmers' Bulletin 293, p. 14.
[8] See "The American persimmon," Indiana Experiment Station Bulletin 60 (1896), p. 52.
[9] Nitrogen-free extract.
[10] Average of 6 analyses in "The American persimmon," Indiana Experiment Station Bulletin 60 (1896).

Probably the most common use of the fruit is as feed for hogs. As a rule, the hogs are merely turned loose in lots where persimmon trees have come up naturally. Some, however, who appreciate the value of this fruit as stock feed have set out orchards in order to provide a definite supply for this purpose. If varieties are selected which ripen in a continuous sequence, the fruit will, in some sections, furnish forage for hogs from the last of August until early winter. A small area devoted to persimmons can thus be made a valuable asset for any general farm located in a persimmon district which includes hogs among its stock.

The persimmon fruits intended for shipment should, to avoid bruising, be carefully hand picked while still quite firm, that is, just as the flesh begins to soften. Fruits which can be delivered direct to the consumer should not be picked until fully mature and should also be handled with great care. Fruit of the later varieties, especially those of the oblong type, often hang on the trees for weeks, drying to about the consistency of the commercial date.

Quart and pint size berry boxes are commonly used when packing the fruit for market, the baskets being handled in the ordinary strawberry crates. Larger units would result in bruising the softer fruits and are therefore not advisable. Crates in which the individual fruits are placed in separate compartments are suggested for shipping the better grades of persimmons, and it is believed that a trade which will fully repay the expense and trouble of this method of handling can be built up in any town of moderate size. Persimmons which are placed in storage should be packed in egg crates or similar containers that hold the fruits separate.

RECIPES FOR USING PERSIMMONS.

Before the advent of the white man, the Indians mixed the pulp of this fruit with crushed corn and made it into a kind of bread. Now, there are many ways in which the fruit can be used, but the different methods are not well known, and many people with fine trees in their possession are allowing the fruit to waste because they do not realize its value. The dissemination of knowledge regarding the use of the persimmon in preparing very palatable food products should result in much wider use of the fruit. To this end a number of recipes are included in this publication.

Since heat makes the astringency of the persimmon more apparent, it is always well to add one-half teaspoonful of baking soda (bicarbonate of soda) to each cupful of persimmon pulp in all recipes where the fruit is subjected to heat. Although it has been proved by experiment that the soda may be omitted if the fruit is entirely free from astringency, it is better to use it until one is sure of the quality of the persimmon pulp.

PERSIMMON BREAD.

1 cup of persimmon pulp.
1 cup of water.
½ teaspoonful of soda.
Yeast.
Shortening.
Flour to make a stiff dough.

Set to rise, mold, and bake like other bread.

PERSIMMON CRUMPETS.

Take 1 pint of the sponge of persimmon bread which has been set over night, add one egg and enough milk to make a thin batter, set to rise for one hour, then bake on a hot griddle like griddlecakes. Serve hot with butter or sirup.

PERSIMMON GRIDDLECAKES.

1 cup of persimmon pulp.
1 egg.
1 cup of flour.
1 teaspoonful of baking powder.
½ teaspoonful of soda.
Milk to make a thin batter.

Bake and serve as above.

PERSIMMON-PEANUT GRIDDLECAKES.

1 cup of persimmon pulp.
1 tablespoonful of peanut butter.
1 egg.
1 cup of flour.
1 teaspoonful of baking powder.
½ teaspoonful of soda.
Milk to make a thin batter.

Bake and serve as above.

PERSIMMON-PEANUT MUFFINS (A GOOD RECIPE FOR CAMPERS).

½ cup of persimmon pulp.
1 tablespoonful of peanut butter.
1 cup of flour.
1 teaspoonful of baking powder.
½ teaspoonful of soda.

Press or cut in pats ½ inch thick and bake in a quick oven.

COFFEE FRUIT CAKE.

Boil together 1 cup of molasses and 1½ cups of minced dried persimmons for five minutes. Cream 1 cup of sugar, ½ cup of butter and 1 egg, and add to the above. Stir in three-fourths of a cup of strong coffee and place on a warm stove. Add 2 cups of flour; 1½ teaspoonfuls of mixed ground spice; 1½ teaspoonfuls of a phosphate baking powder, or if preferred, 1 teaspoonful of baking powder and ½ teaspoonful of soda.

Bake in a moderate or slow oven 40 minutes to 1 hour.

PERSIMMON CAKE.

1 cup of persimmon pulp.
½ cup of sugar.
1 egg.
Butter of size of a walnut.
1 cup of flour.
1 teaspoonful of baking powder.
½ teaspoonful of soda.

Bake 40 minutes in a moderate oven. For a soft pudding leave out the eggs. For a custard leave out the flour and the baking powder.

PERSIMMON PUDDING (CAKE OR PONE).[1]

1 pint of fine persimmon pulp.
1 cup of sugar.
1 quart of sweet milk.
3 cups of flour.
1 teaspoonful of ground cinnamon.
2 teaspoonfuls of baking powder.

[1] The American persimmon. Indiana Experiment Station Bulletin 60, pp. 43–54, 1896.

PRESERVED PERSIMMON PULP.

Place equal amounts of persimmon pulp and sugar in glass or earthenware jars or in coated sanitary cans. (Never use cans of uncoated tin for persimmons.) Mix thoroughly and set in a cool, light place. Stir occasionally until the air is removed and seal with paraffin or waxed paper. The cans may be heated over a slow fire, just enough to drive out the air, and should be sealed at once.

PRESERVED WHOLE PERSIMMONS.

Put a thin layer of sugar in the bottom of a jar; then a layer of whole ripe persimmons, then a layer of sugar; and so on until the jar is full. The sugar will soon dissolve and form a sirup. Press the upper fruits down under the sirup or add more sirup to the jars. Seal and store until used. The sirup may be drained off and the fruits served like dates, which they will resemble very much in both appearance and flavor.

PERSIMMON LEATHER.

Spread a thin layer of ripe persimmon pulp on waxed paper or on a large platter. Dry in the sun, in a fruit evaporator, or in the oven of a stove, leaving the oven doors open. Remove the seeds. Add another layer of pulp, and repeat until the leather is of a thickness to handle easily. This may be diced or minced and used instead of raisins or citron in fruit cakes, cookies, or puddings.

PERSIMMON ICE CREAM.

2 cups of persimmon pulp. 1 cup of thick, sweet cream.

Beat together thoroughly and freeze like ordinary ice cream. The fruit must be thoroughly ripe and nonastringent.

PERSIMMON FRUIT ICE.

2 cups of persimmon pulp. 1 cup of sugar.

Beat to a creamy pulp and freeze.

PERSIMMON TAFFY.

Two cups of the sirup from the preserved whole persimmons. Add 1 cup of sugar and cook until it forms a hard ball in water. Pour on a buttered platter and pull. Cut in sticks and squares.

PERSIMMON FUDGE.

2 cups of persimmon pulp. 2 cups of sugar.

Cook over a slow fire, stirring occasionally, until graining begins. Add 1 teaspoonful of baking soda and stir over the fire until quite stiff. Spread on buttered platter or paraffin paper.

SELECTED AND CULTIVATED NAMED VARIETIES.

The native persimmon varieties that have thus far received names and been disseminated for cultivation have originated as chance seedlings, being brought into cultivation from the wild state. With few exceptions, the fruits of these varieties are of the oblate type. Brief descriptions of the fruit of some of the better known varieties follow.

DESCRIPTIONS OF VARIETIES.

Burrier. Origin, central Kentucky, where it ripens rather early; form, oblate; size, medium; color, yellow; practically seedless; flesh, soft; quality, very good.

Boone (*Daniel Boone*). Origin, Indiana, where it ripens during October and November; form, roundish oblate; size, medium; color, yellow, with a dull blush in the sun; skin, rather tough; seeds, numerous; flavor, sweet but not rich; quality, good.

Delmas. Origin, Scranton, Miss., where it ripens during October and early November; form, roundish oblate; size, medium to large; color, reddish yellow; skin, thin and tough; seeds, numerous; flavor, sweet and rich; quality, very good.

Early Bearing. Introduced from Cartersburg, Ind., where it ripens early in October; form, round ovate; size, medium; color, dull yellow; quality, good.

Early Golden. Origin, Illinois, where it ripens in September; form, oblong; size, medium to large; color, yellow; skin, thin; seeds, few; flavor, sweet; quality, very good.

Golden Gem. Introduced from Borden, Ind., where it ripens from August to October; form, roundish oblong; size, medium to large; color, dark orange to red; seeds, few; flavor, rich and sweet; quality, good.

Hicks. Origin, Washington County, Ind., where it ripens in October; form, roundish oblate; size, medium to large; color, dark red; skin, thin and tender; seeds, few; flavor, rich; quality, very good.

Josephine (*American Honey, Honey*). Origin near Bluffton, Mo., where it ripens in September; form, roundish oblate; size, medium; color, bright yellow, changing to pale translucent; skin, tough; seeds, few; flavor, sweet and rich; quality, good.

Kansas. Introduced from Missouri, where it ripens in September; form, roundish oblate; size, rather large; color, yellow splashed with red; flavor, rich; quality, very good.

Miller. Origin, Jackson County, Mo., where it ripens in September; form, roundish oblate; size, large; color, reddish yellow, translucent; skin, tough; seeds, rather numerous; flavor, sweet; quality, good.

Ruby (*Little's Ruby*). Introduced from Cartersburg, Ind., where it ripens during September and for some time later; form, roundish oblate; size, small to medium; color, yellowish red, shading to deep red; skin, tender; seeds, few; flavor, sweet; quality, very good.

Shoto. Introduced from Danville, Ind., where it ripens during October; form, oblong ovate; size, large; color, dull yellow, blushed in the sun; skin, rather tough; seeds, few; quality, very good.

Smeech. Introduced from Pennsylvania, where it ripens during October and November; form, roundish oblate; size, medium; color, dull yellow, splashed with red; flavor, rich and sweet; quality, very good.

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